

Four new species of mesozoan parasites (Mesozoa: Dicyemidae) from cephalopods of Bay of Bengal

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Abstract. Four new species of mesozoans viz *Dicyema ganapatii* n.sp. from the renal appendages of *Sepia elliptica* Hoyle, *Dicyema madrasensis* n.sp. and *Dicyema octopusi* n.sp. from the renal appendages of *Octopus* sp., and *Dicyema nouveli* n.sp. from the renal appendages of *Loligo duvauceli* d'Orbigny are described. All the hosts were collected from different localities on the east coast of India.

Keywords. Mesozoan parasites; cephalopods.

1. Introduction

The mesozoan parasites inhabiting the renal appendages of cephalopods in India have received scant attention. So far only two, *Dicyemenea coromandelensis* (Kalavati *et al* 1978) and *Dodecadicyema loligoi* (Kalavati and Narasimhamurti 1980) are reported from the cephalopods of the east coast of India. The present paper deals with four new species belonging to the genus *Dicyema* parasitic in three different genera of cephalopods. The total number of mesozoans reported from India so far is six, four belonging to the genus *Dicyema* (present paper) and the other two one each belonging to the genera *Dodecadicyema* and *Dicyemenea*. The genus *Dicyema* is characterised by the presence of two tiers of four cells each oppositely arranged. The anterior tier is known as propolars and the posterior as metapolars. A check list of all the species of *Dicyema* described so far is also given.

2. Material and methods

The cephalopods were obtained from the catches in different places on the east coast extending from Kalingapatnam on the north to Madras on the south. The hosts after collection are brought to the laboratory within 2-3 hr in ice packed thermos-flasks. The fluid obtained by puncturing the renal appendages is examined for parasitic mesozoans. When infected the smears are air dried fixed in methyl alcohol and stained with Giemsa in the usual manner. Smears are also fixed in alcoholic Bouin's fluid and stained with Heidenhain's iron haematoxylin or Ehrlich's acid haematoxylin. Some of the smears are fixed in Carnoy's fluid and treated according to Feulgen's technique. General cytochemical tests like PAS, Best's carmine, alcian blue, bromophenol blue and sudan black B are conducted to know the nature of cell inclusions. The description of the parasite is based on atleast 100 forms taken at random. All the diagrams are made with the aid of a camera lucida.

3. Observations

3.1 *Dicyema ganapatii* n.sp. (figures 1–14)

Site of infection: Renal appendages

Host: *Sepia elliptica* Hoyle

Locality: Offshore fishing Station, Visakhapatnam, India

Out of the 78 specimens of *Sepia elliptica* Hoyle (8–28 cm) of both sexes examined 28 of them harboured a new species of *Dicyema*.

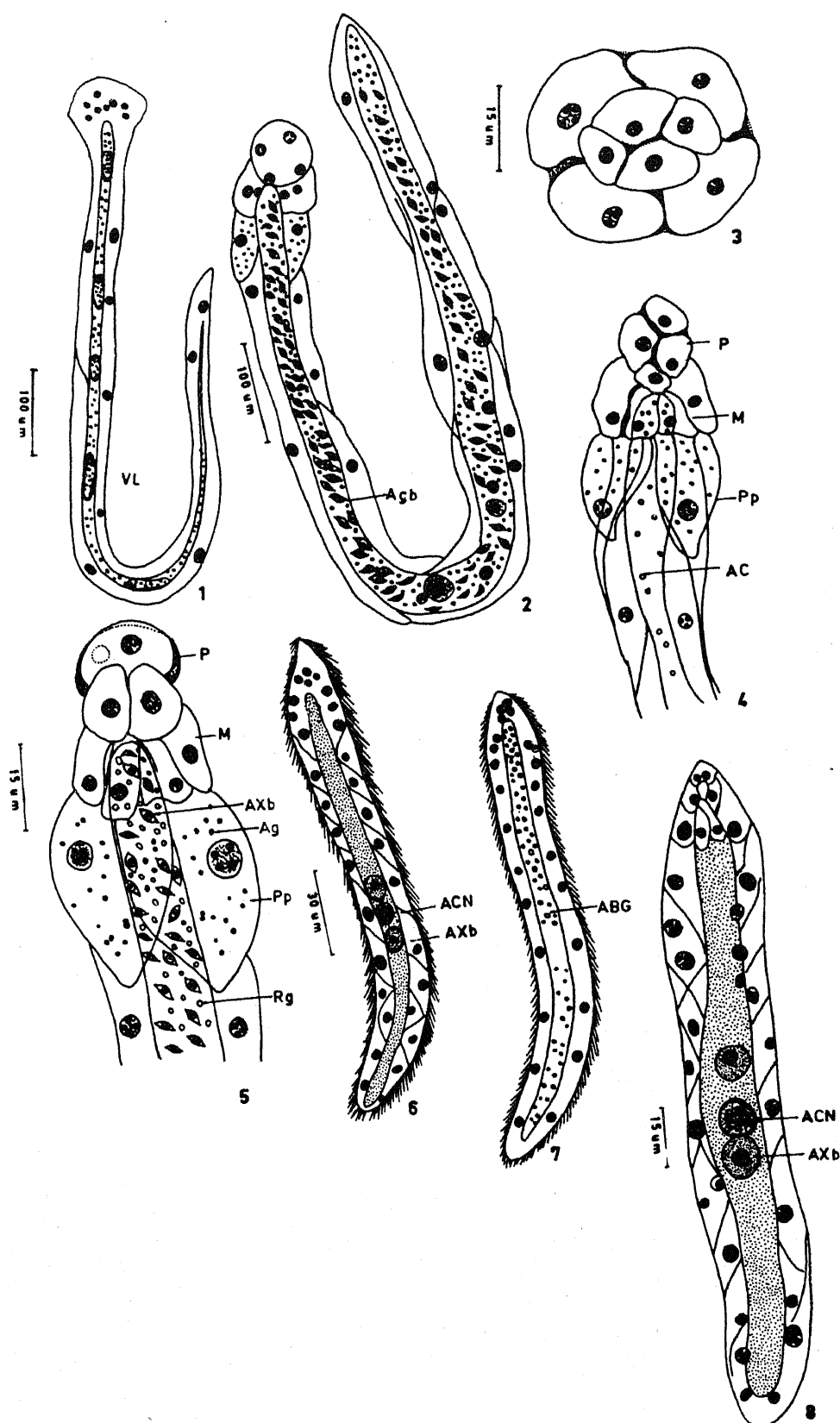
Description: The peripheral cell number varies from 28–32, usual number being 31 (table 1). They consist of 4 propolars, 4 metapolars, 17–20 diapolars (usual number being 19) and two uropolars.

3.1a Nematogens: The body is uniformly slender and long (measuring 405–975 $\times$ 25–50 μ m). They are uniformly covered with cilia (figures 1 and 2). The calotte is expanded and is orthotropical in most of the cases. A few plagiotropical forms are also seen (figures 3 and 4). It is typically composed of 8 cells arranged in two tiers of 4 each. The propolars are elongated and are widest in the middle and taper bluntly at both ends (figure 5). In the older forms they contain a few acidophilic granules. The axial cell is bluntly rounded at the anterior end and extends up to the base of propolars and is surrounded by the four metapolar cells (figure 5). In a mature nematogen the nucleus is divided and a number of agametoblasts fill the entire area of the axial cell. The axial cell is filled with refringent granules. As many as five vermiform embryos are seen in a single nematogen (figure 1).

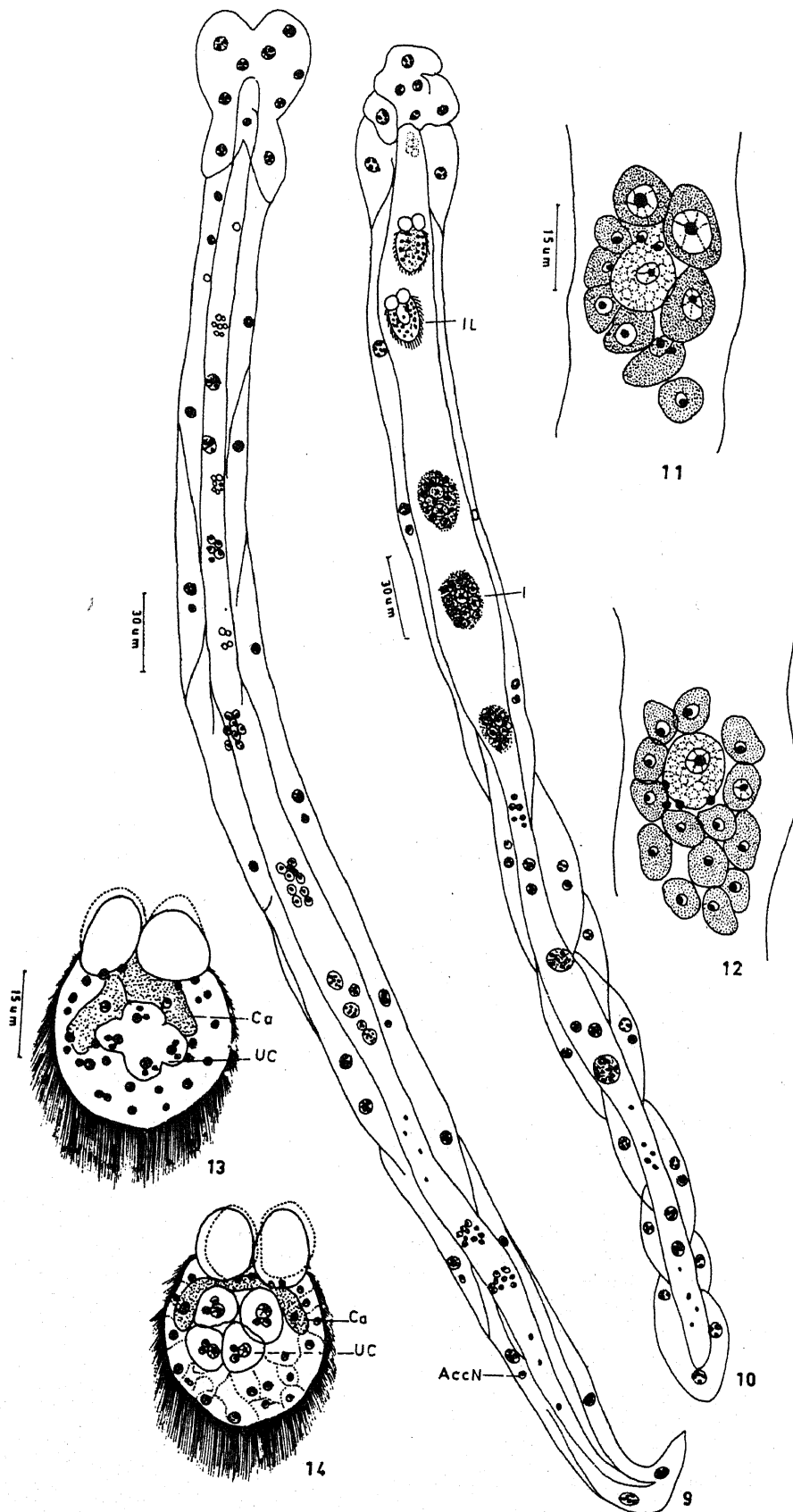
3.1b Vermiform larvae: The body is thin and vermiform (measuring 150–390 $\times$ 15–22 μ m). The calotte is pointed and occupies 1/5 the length of the body. The anterior end of the axial cell extends up to the base of the propolars. There is a single axial cell and two axoblasts, one on either side of the axial cell nucleus (figure 8). The diapolars are paired and opposed. The axial cell is filled with a number of alcian blue positive granules which are absent in other cells except at the tip of the calotte.

3.1c Rhombogen: They are similar to nematogens but are larger and measure 575–1200 $\times$ 30–90 μ m. The somatic cell number in the calotte is the same as that in the nematogens. The shape of the calotte is, however, different being elliptical and sometimes bilobed (figure 9). A number of accessory nuclei are observed in the trunk cells. The axial cell is slightly expanded anteriorly and 2–3 infusoriform larvae are found at the anterior end and 3–4 infusorigens in the middle of the body. There are no granular inclusions in the axial cell (figure 10). The infusorigens are smaller in size and have 5–9 oogonia and 2–4 spermatogonia (figures 11 and 12).

3.1d Infusoriform larvae: They are elliptical (30–45 $\times$ 22–45 μ m) and are uniformly covered with cilia, those at the posterior end being longer than those at the anterior end giving a spherical shape to the body (figure 13). The cell number varies from 28–32. There are four moderately sized solid refringent bodies occurring in pairs. The urn cells are four in number, equal in size and contain one generative nucleus and two somatic nuclei. The capsule cells are bigger and form a hood-like structure around the urn cells



Figures 1-8.



Figures 9-14.

Table 1. Somatic cell number in *Dicyema ganapatii* n.sp.

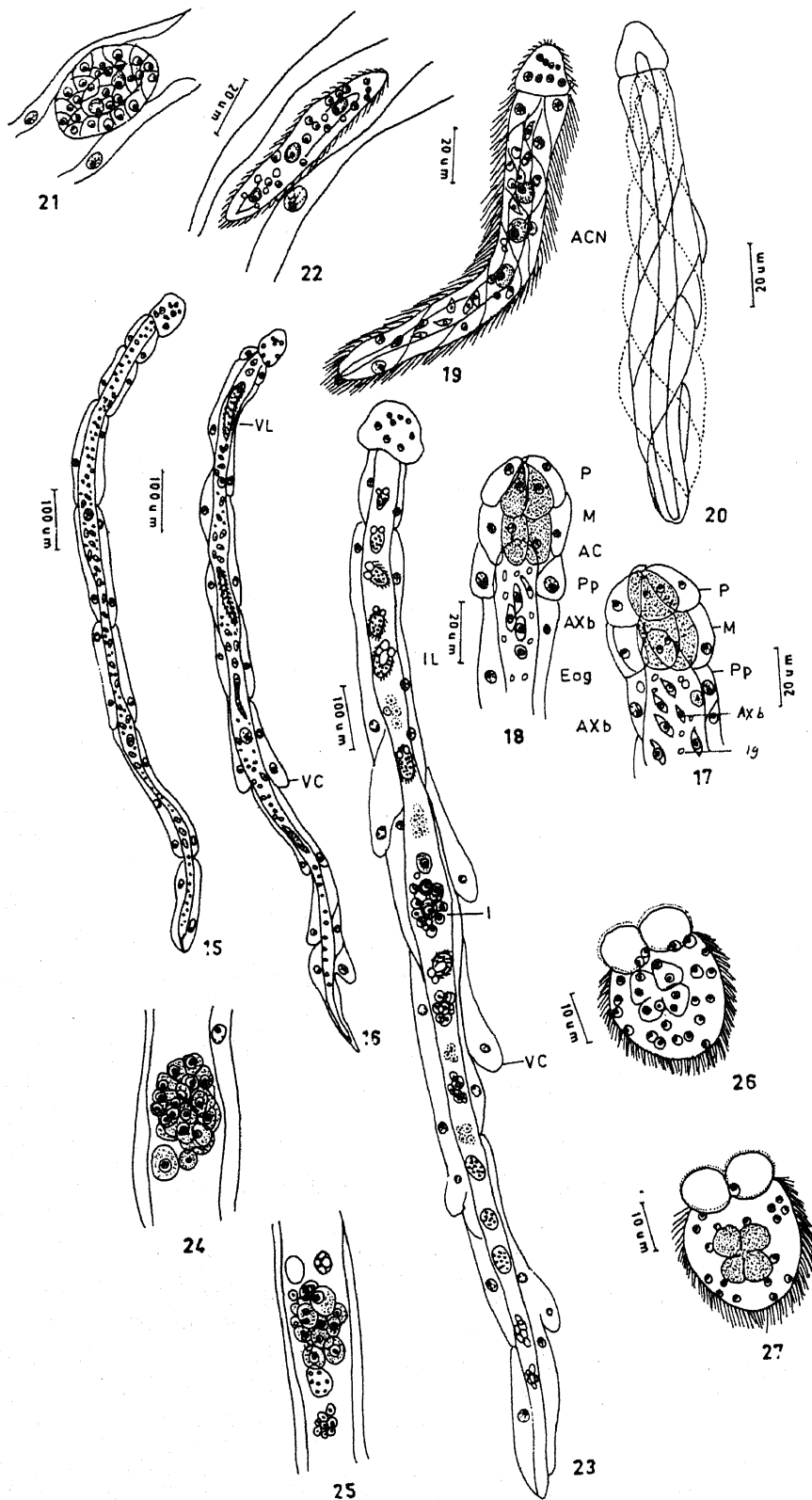
Cell number	Vermiform larvae	Nematogens	Rhombogens	Total
28	—	3	—	3
29	6	2	2	10
30	22	12	8	42
31	42	64	32	138
32	—	2	1	3
Total	70	83	43	196

(figure 14) occupying an antero ventral position as in *D. maorum* (Short 1971). The nuclei of the capsule cells are pushed to a lateral position of the urn cells. Acidophilic granules are present in these cells.

3.1e *Remarks:* Several species of mesozoan parasites belonging to the genus *Dicyema* have been reported from cephalopods and among them *D. macrocephalum* (Van Beneden 1876) from *Sepiola roanaeletti* (somatic cell number 30), *D. schulzianum* (Van Beneden 1876) from *Sepia biserialis* (somatic cell number 22) and *D. truncatum* (Whitman 1883) from *Sepia officinalis*, *S. elegans* and *Rossia macronema* (somatic cell number 22) are from decapod cephalopods while the others are from octopod cephalopods. In the present form the somatic cell number varies from 28–32, the usual number being 31 and in this respect it comes close to *D. macrocephalum*. In *D. macrocephalum* the calotte is plagiotropic, the propolars are subequal and the metapolars are unequal while in the present form the calotte is generally orthotropol and occupies 1/3 the length of the body and the propolars are small and oval while the metapolars are expanded and large. The somatic cells in *D. macrocephalum* are arranged in six alternating rows of three each interposed between the parapolars and the caudal cells while in the present form the body cells are in opposed pairs. The parapolars are characteristically elongated and expanded with a number of acidophilic granules. The axial cell extends up to the base of the propolars and contain 4–5 vermiform larvae where as in *D. macrocephalum* the axial cell extends up to the base of the metapolars only. The nematogens in *D. macrocephalum* are bigger in size (5–7 mm) than those in the present form (405–975 × 25–30µm only). *D. schulzianum* and *D. truncatum* have a somatic cell number of 22 with the latter having a small, discoid calotte which covers the broad truncated end and hence is not comparable with the present form.

None of the other species of *Dicyema* reported from *Octopus* sp. have a somatic cell number comparable to the present form and as such the present form is considered a new species and the name *Dicyema ganapatii* n.sp. is proposed in honour of late Prof. P N Ganapati.

Figures 1–14. *Dicyema ganapatii* n.sp. 1, 2. Entire nematogens, 3. Optical view of the calotte, 4 and 5. Enlarged views of the calotte—Note propolars in figure 5, 6, 7 and 8. Vermiform larvae, 9 and 10. Rhombogens—entire, 11 and 12. Infusorigens, 13 and 14. Infusoriform larvae.



Figures 15-27. *Dicyema madrasensis* n.sp. 15 and 16. Nematogens—entire, 17 and 18. Enlarged view of the calotte, 19-22. Vermiform larvae (21 and 22 are larvae within the cell), 23. Rhombogen—entire, 24 and 25. Infusorigens, 26 and 27. Infusoriform larvae.

3.2 *Dicyema madrasensis* n.sp. (figures 15–27)

Site of infection: Renal appendages

Host: *Octopus* sp.

Locality: Royapetah beach, Madras.

Twenty of the 30 sexually mature specimens of *Octopus* sp. collected in November 1981 were infected by a new species of *Dicyema* which is described here.

Description: Peripheral cell number varies from 24–31 containing 4 propolars, 4 metapolars, 2 or 3 parapolars, 12–18 diapolars and 2 uropolars.

3.2a Nematogens: The body is long and uniformly slender (measuring $980\text{--}1670 \times 70\text{--}90\mu\text{m}$) (figures 15 and 16). The calotte is broadly oval and measures $24\text{--}32 \times 30\text{--}40\mu\text{m}$. The propolars and metapolars are almost equal in size (figure 17). The peripheral propolars and metapolars are faintly stained when compared to those in the centre. The parapolars are triangular with a conspicuously big nucleus. The axial cell extends up to the middle of the metapolars (figure 18). Numerous eosinophilic granules and axoblasts are present in the axial cell. There are 4–6 verruciform cells. 3–4 vermiform larvae are present inside a single nematogen.

3.2b Vermiform larvae: Mature vermiform larvae range in size from $100\text{--}128 \times 9.6\text{--}15.4\mu\text{m}$. They are uniformly thin with bluntly pointed anterior and posterior ends. There are three axial cell nuclei with numerous axoblasts. The somatic cells are spirally arranged in whorls of three (figures 19 and 20). The body is covered with cilia but the calotte cilia are much shorter than those present on the body. They measure $30\text{--}65 \times 15\text{--}20$ at eclosion and typically contain three axial cell nuclei (figures 21 and 22).

3.2c Rhombogens: They are long and slender and sometimes longer than the nematogens and measure $1280\text{--}2400 \times 80\text{--}120\mu\text{m}$. The axial cell is filled with a large number of infusorigens which show as many as 14–18 infusoriform larvae in the axial cell. There are 4–6 verruciform cells (figure 23).

3.2d Infusorigens: They are relatively large and contain 14–18 oogonia and oocytes and 2–4 spermatogonia and spermatocytes (figures 24 and 25).

Table 2. Somatic cell number of *Dicyema madrasensis* n.sp.

Cell number	Nematogens	Vermiform larvae	Rhombogens	Total
24	6	6	2	14
25	—	—	1	1
26	1	—	1	2
27	38	34	36	108
28	—	—	—	—
29	—	—	—	—
30	16	18	8	42
31	22	16	20	58
Total	83	74	68	225

3.2e *Infusoriform larvae*: They are oval or spherical with a blunt posterior end and measure $26.8\text{--}32 \times 20\text{--}24\mu\text{m}$ and are uniformly covered with short cilia (figures 26 and 27). There are two refringent bodies which are equal in size measuring $9.6\mu\text{m}$ in diameter and appear thick and double layered. The urn cells are deeply stained and contain one somatic and one generative nucleus. The cell number varies from 28–32.

3.2f *Remarks*: The present form from *Octopus* sp. collected from Madras has a somatic cell number which varies from 24–31, the usual number being 27 and in this respect it resembles *D. acciaccatum* Mc Connaughey, 1949 (somatic cell number 22, up to 28), *D. acheronae* Mc Connaughey, 1949 (somatic cell number 23–28), *D. clausianum* Van Beneden, 1876 (somatic cell number 27) but differs considerably in other characters. In *D. acciaccatum* the usual number of somatic cells is 22 unlike in the present form where it is 27. The axial cell in the present form extends up to the middle of the metapolars and contains several axoblasts and eosinophilic granules while in *D. acciaccatum* the axial cell terminates at the base of the metapolars. The calotte in the present form is bluntly pointed while it is elongated in *D. acciaccatum*. In *D. acheronae* the somatic cell number varies between 23–28 and the axial cell ends behind the metapolars unlike in the present form. *D. clausianum* has a somatic cell number of 27 which compares favourably with the present form but it differs in the shape of the calotte and the size of the nematogens and rhombogens. The present form differs from all the other species described above in having equal sized propolars and metapolars and triangular parapolars with conspicuous nuclei. A characteristic differential staining of the peripheral and central pro- and meta-polars is a unique feature of this species. This is the first report of a mesozoan from *Octopus* sp. from the Madras coast. In view of what is stated the present form is considered new to science for which the name *Dicyema madrasensis* n.sp. is proposed.

3.3 *Dicyema octopusi* n.sp. (figures 28–39)

Site of infection: Renal appendages

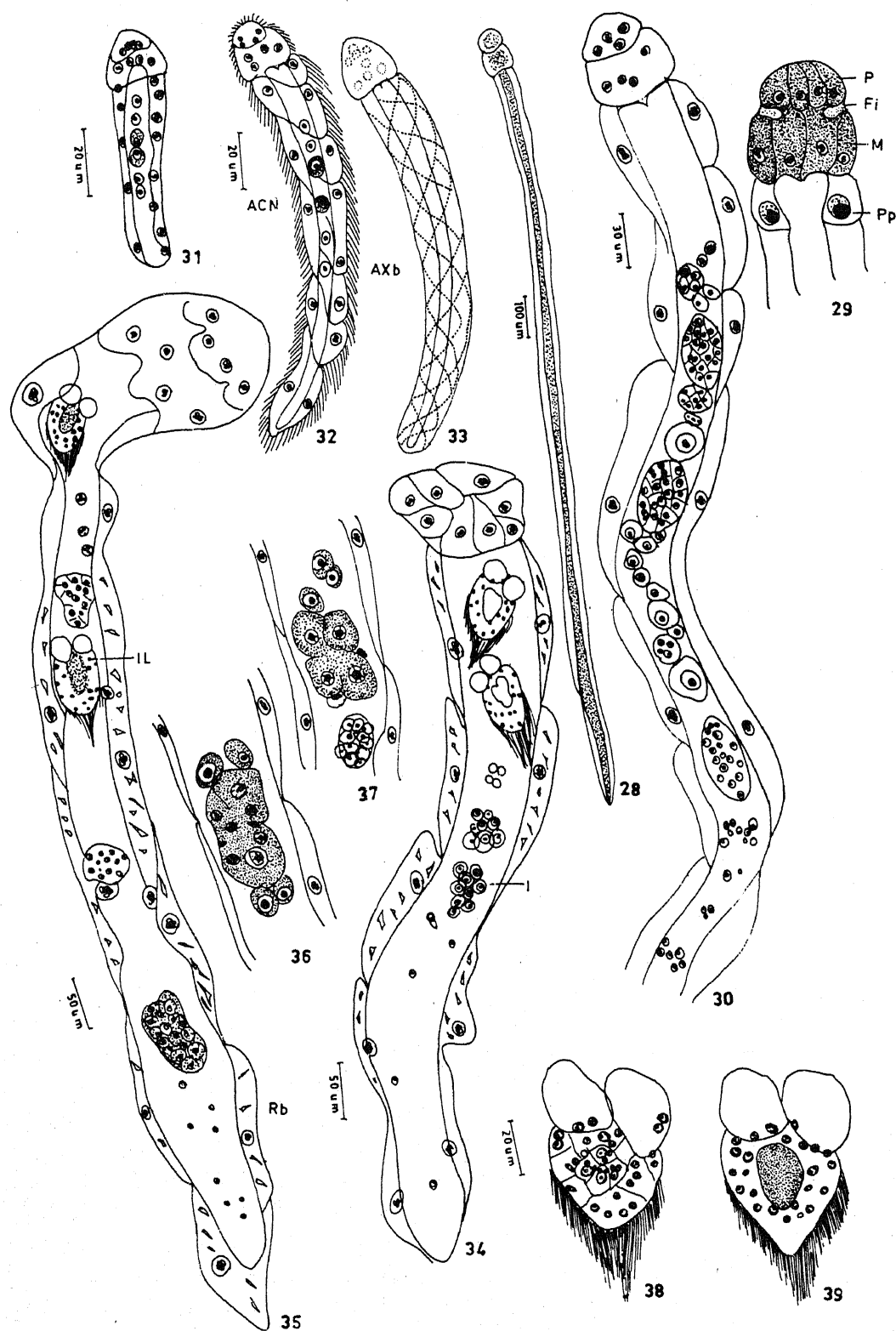
Host: *Octopus* sp.

Locality: Offshore Fishing Station, Visakhapatnam (Andhra Pradesh).

Fifty-five specimens of *Octopus* sp. ranging in size from 15–25 cm and belonging to both the sexes were examined of which 15 were infected with *D. octopusi*.

Description: Peripheral cell number varies from 18–20, the usual number being 20, consisting of 4 propolars, 4 metapolars, 2 parapolars, 8–10 diapolars and 2 uropolars.

3.3a *Nematogens*: Numerous nematogens are found attached to the hepatic cell mass as well as to the renal appendages. They are long ranging in size from $566\text{--}1828 \times 24\text{--}62\mu\text{m}$ (figure 28). The calotte is orthotropical with an oval anterior end and a broad flat posterior end. The propolars are generally smaller than the metapolars. There are two flask-shaped invaginations at the junction of the pro- and meta-polars (figure 29). They are lightly stained with haematoxylin and are stained blue with alcian blue with 0.06 MgCl_2 after hydrolysis with H_2SO_4 showing the presence of hyaluronic acid. In sectioned material the anterior part of the calotte up to the invaginations is embedded



Figures 28–39. *Dicyema octopusi* n.sp. 28. Nematogen, 29. Calotte enlarged view, 30. Nematogen-anterior part enlarged, 31–33. Vermiform larvae, 34 and 35. Rhombogens entire, 36 and 37. Infusorigens, 38 and 39. Infusoriform larvae.

Table 3. Somatic cell number of *Dicyema octopusi* n.sp.

Cell number	Nematogens	Vermiform larvae	Rhombogens	Total
18	8	10	—	28
19	18	32	4	54
20	22	64	11	97
Total	48	106	15	169

in the tissue. The axial cell is bilobed at the anterior end and extends up to the base of the metapolaris. The two parapolar cells are square-shaped with a big nucleus and a conspicuous nucleolus (figure 29). Numerous developing vermiform larvae are seen in a single nematogen, mostly in the anterior part of the axial cell (figure 30).

3.3b *Vermiform larvae*: (figures 31–33) Mature larvae vary in size from $180\text{--}200 \times 20\text{--}24\mu\text{m}$. They are very small at eclosion and measure $50\text{--}60 \times 10\text{--}15\mu\text{m}$. The calotte is fairly conspicuous having a broad base. There are two axial cell nuclei. There are typically four axoblasts, two being anterior and the other two being posterior to the axial cell nucleus (figure 32). The somatic cells are spirally arranged around a central axial cell (figure 33) and the body is uniformly covered with cilia except in the region of the calotte where they are shorter.

3.3c *Rhombogens*: (figures 34 and 35) They are comparatively few in number in the smears. They are broad and short and measure $680\text{--}980 \times 80\text{--}120\mu\text{m}$. The anterior end is greatly expanded into a club-like structure. Infusorigens and infusoriform larvae are few in number and are generally seen in the anterior half of the axial cell. The diapolaris are irregularly placed and contain a number of refringent bodies. There are no verruciform cells.

3.3d *Infusorigens*: They are small and deeply stained with only 4–8 oogonia and 2–4 spermatocytes (figures 36 and 37).

3.3e *Infusoriform larvae*: (figures 38 and 39). They are oval in shape having a pointed posterior end and measure $45\text{--}55 \times 40\text{--}50\mu\text{m}$. There are two solid refringent bodies measuring 20.6×12.6 placed at the anterior end. The cilia present in the posterior half of the body form a long tuft at the posterior tip. The urn cells are small with a single germinal and two somatic nuclei. The number of cells vary from 34–36.

3.3f *Remarks*: The somatic cell number in the present form varies from 18–20, the usual number being 20. Other species of *Dicyema* whose somatic cell number falls within this range are *D. acuticephalum* (Nouvel 1947) (somatic cell number usually 18 exceptionally 19), *D. briarei* (Short 1961) (somatic cell number 20–22), *D. robsonellae* (Short 1961) (somatic cell number typically 20) and *D. typoides* (Short 1964) (somatic cell number 18 or 19, rarely 16, 17 or 20). The calotte in *D. acuticephalum* is more pointed than in the present form. The axial cell extends only up to the base of the metapolaris in *D. acuticephalum* while in the present form the calotte is conspicuous

with an oval anterior and a broad flat posterior end. Although the axial cell extends up to the base of the metapolars, it is bilobed at the anterior end and hence differs. In *D. briarei* the somatic cell number varies from 20–22, 22 being the common number unlike in the present form where it is 20. Further in *D. briarei* the anterior extent of the axial cell is variable and extends almost up to propolars in vermiform larvae, inserted between metapolars and extending anteriorly to the middle of the metapolars or beyond, sometimes reaching propolars in rhombogens, ending at or beyond the base of the metapolars in nematogens which is different from what is seen in the present form. In *D. robsonellae* has a somatic cell number of 22 and the calotte forms a thin cap over the enlarged anterior end of the axial cell which is absent in the present form. In *D. typus* there are a variable number of somatic cells ranging from 16–20 (usually 18) but the axial cell extends up to the base of the propolars ending usually between the propolars unlike in the present form.

In view of the above differences and also because of the specific characters such as the possession of small flask-shaped invaginations at the junction of pro- and meta-polars, the possession of a posterior tuft of cilia in infusoriform larvae in the present form it is considered new to science for which the name *Dicyema octopusi* n.sp. is proposed.

3.4 *Dicyema nouveli* n.sp. (figures 40–55)

Site of infection: Renal appendages

Host: *Loligo duvauceli* d'Orbigny

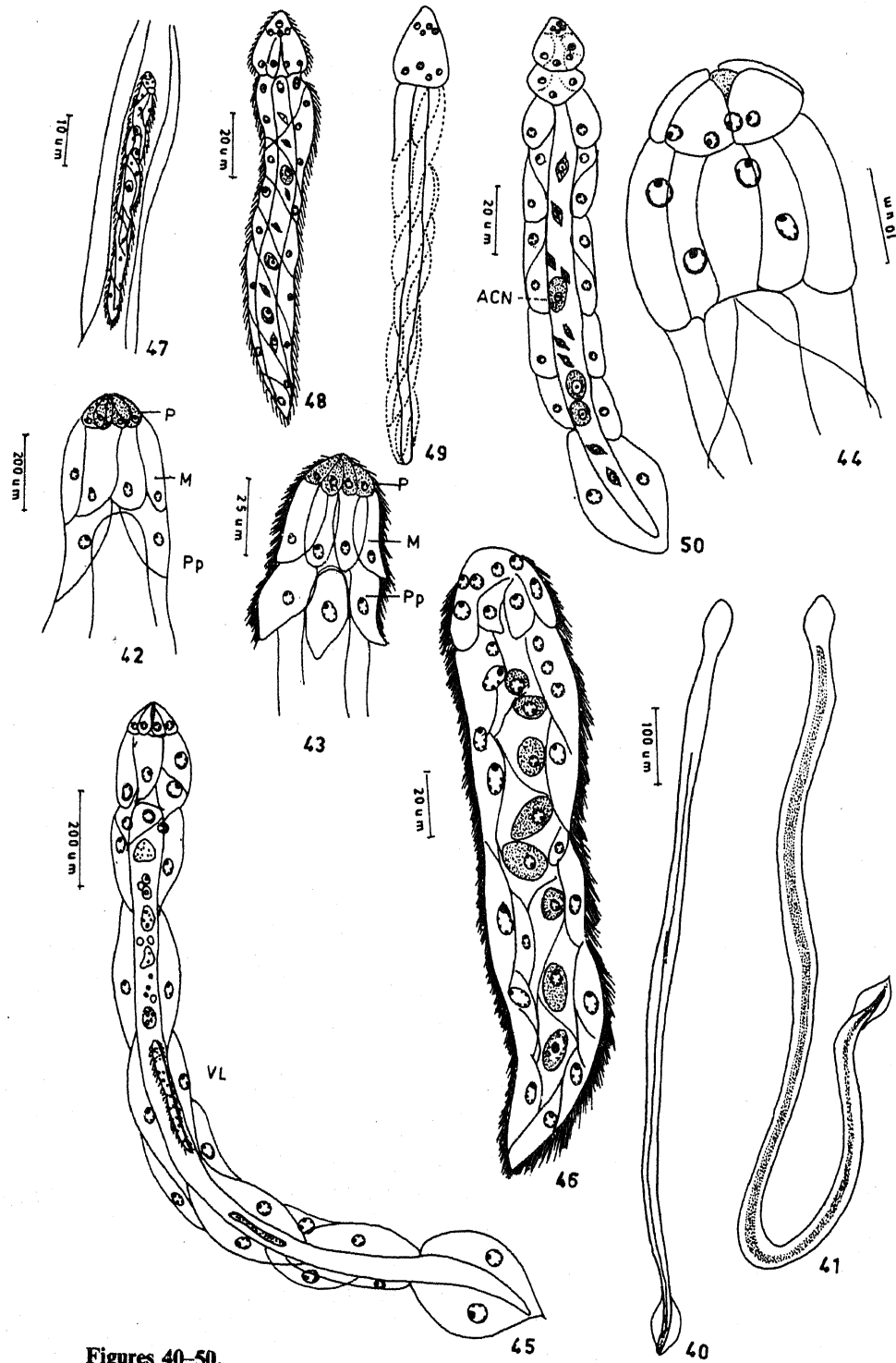
Locality: Kalingapatnam (Andhra Pradesh)

Eight of the 26 specimens of *Loligo duvauceli* collected from Kalingapatnam are infected with a new mesozoan which is described here.

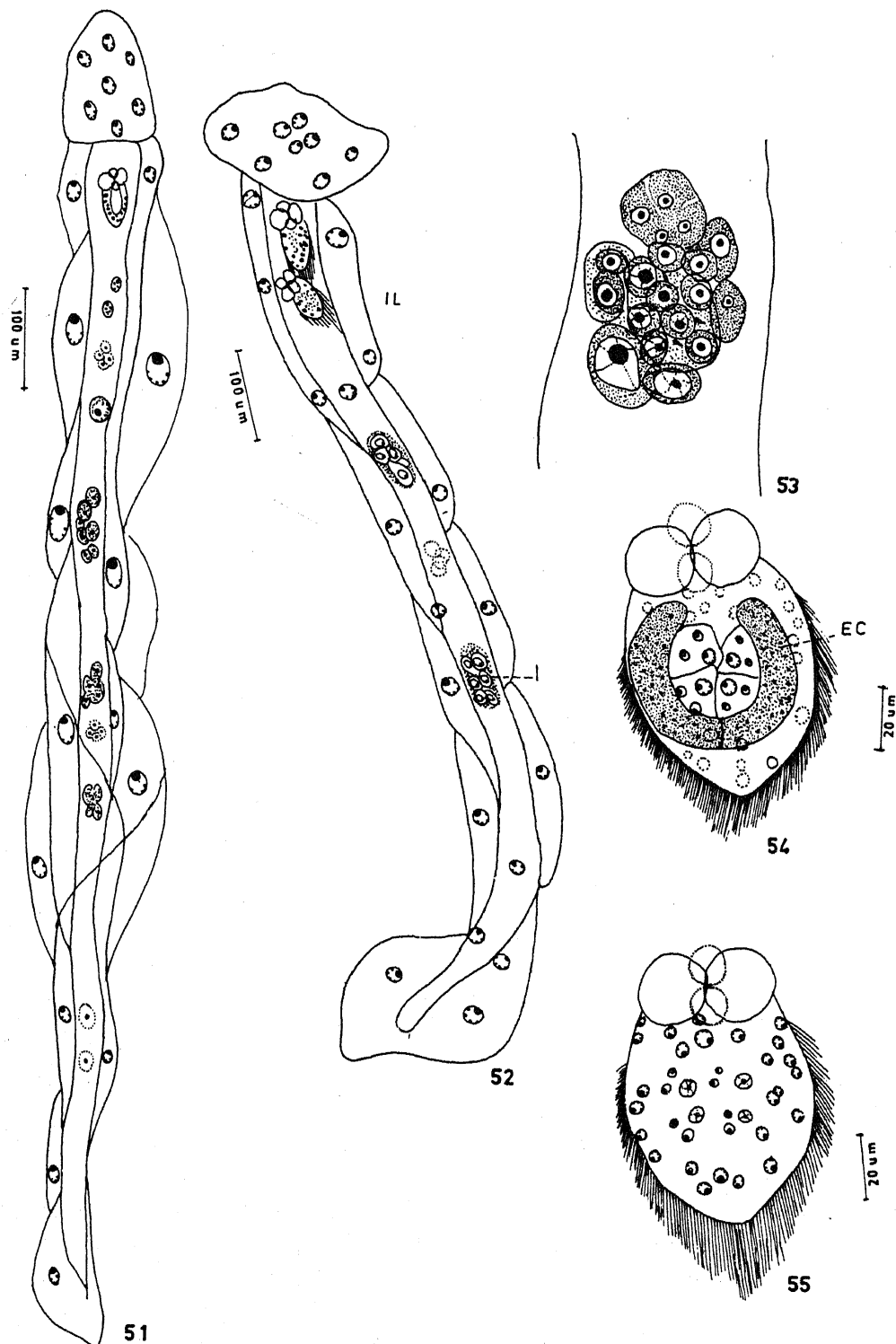
Description: Peripheral cell number varies from 26–28 consisting of 4 propolars, 4 metapolars (occasionally 3), 2–3 parapolars, 12–14 diapolars and 2 uropolars.

3.4a Nematogens: (figures 41 and 42) The body is uniformly long and slender and expanded and fin-like at the uropolar region. Twenty five of them measure 1.76×0.0056 mm. There is no conspicuous swelling at the cephalic region. The calotte is plagiotropic, elongated and measures $30\text{--}40 \times 20\text{--}25 \mu\text{m}$ with small deeply stained propolars and 3–4 elongated metapolars. The axial cell extends up to the base of the calotte (figures 42–44). Parapolars (2 or 3) are very much elongated. The diapolars are arranged spirally around the axial cell. There are no inclusions or accessory nuclei or verruciform cells. One or two vermiform embryos are seen in the axial cell of a single nematogen (figure 45). Occasionally a few stem nematogens are observed entangled in the mass of renal appendages (figure 46). They measure $200\text{--}250 \times 100\text{--}120 \mu\text{m}$.

3.4b Vermiform larvae: Mature vermiform stages are relatively rare and are small in size and measure $50\text{--}65 \mu\text{m}$ at eclosion (figure 47). The body is uniformly thin with a narrow constriction at the cephalic region. The anterior end is finely pointed. Twenty five vermiform embryos outside the host measure $120\text{--}160 \times 20\text{--}30 \mu\text{m}$. There are three axial cell nuclei each having 5–10 axoblasts. The somatic cells are arranged spirally around a single axial cell. The body is uniformly covered with cilia (figures 48–50). There are three axial cell nuclei and 5–8 axoblasts.



Figures 40-50.



Figures 40-55. *Dicyema nouveli* n.sp. 40 and 41. Nematogens entire, 42-44. Calotte enlarged views, (Note 2 parapolaris in figure 42 and 3 in figure 43), 45. A nematogen showing vermiform larvae in axial cell, 46. Stem nematogen, 47-50. Vermiform larvae, 51 and 52. Rhombogens entire, 53. Infusorigen, 54 and 55. Infusoriform larvae.

Table 4. Somatic cell number of *Dicyema nouveli* n.sp.

Cell number	Nematogens	Vermiform larvae	Rhombogens	Total
26	12	8	18	38
27	28	6	12	46
28	36	4	20	60
Total	76	18	50	144

3.4c *Rhombogen*: They are short and stumpy and measure $0.88-0.96 \times 0.015-0.28$ mm. The calotte is generally irregular in shape with a broad cephalic region (figures 51 and 52). Infusorigens and infusoriform larvae are restricted to the anterior apex of the cell (figure 52). There are no inclusions either in the axial cell or in the diapolars. Verruciform cells are observed. The infusorigens show 6-8 oogonia and oocytes and 2-4 spermatogonia and spermatocytes (figure 53).

3.4d *Infusoriform larvae*: They are oval in shape and measure $75-90 \mu\text{m} \times 20-40 \mu\text{m}$ with four spherical refringent bodies, two of them being smaller in size measuring $10 \mu\text{m}$ in diameter and the other two being larger in size measuring $20.2 \mu\text{m}$ in diameter. Urn cells are deeply stained with three nuclei, one generative and two somatic. Clavicle cell encircles the urn cells at the postero lateral margin like a small band filled with eosinophilic granules. The cell number varies from 36-38. The posterior cilia are longer (figures 54 and 55).

3.4e *Remarks*: The peripheral cell number in the present form varies from 26-28 and in this respect it comes close to *Dicyema acciaccatum* Mc Connaughey, 1949 (somatic cell number 22, up to 28), *D. acheroni* Mc Connaughey, 1949 (somatic cell number 23-26) and *D. clausianum* Van Beneden, 1876 (somatic cell number 27). However, it differs from *D. acciaccatum* in the typical number of somatic cells and the different stages of the present form are smaller in size. The calotte is elongated in *D. acciaccatum* while it is round or bluntly oval in the present form. The present form also differs from the other two species, *D. acheroni* and *D. clausianum* in the size and shape of the calotte and in the expanded uropolars.

The unique features of the present form are the presence of 2-3 elongated parapolars, unequal pro- and meta-polars and expanded flat uropolars. Further all the above mentioned species are reported from *Octopus* sp. and from California, USA while this is the only form from *Loligo duvauceli* from the Bay of Bengal. In view of this the present form is considered new and is designated as *Dicyema nouveli* n.sp.

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Abbreviations:

ABG—Alcian blue granules; AC—Axial cell; AccN—Accessory nuclei; ACN—Axial cell nucleus; Ag—Acidophilic granules; AgB—Agametoblasts; AXB—Axoblasts; Ca—Capsule cell; EoG—Eosinophile granules; FI—Flask-shaped invaginations; I—Infusorigens; IL—Infusoriform larvae; M—Metapolars; P—Propolars; Pp—Parapolars; Rb—Refringent bodies; Rg—Refringent granules; UC—Urn cells; VC—Verruciform cells; VL—Vermiform larvae.

Check list of species of *Dicyema*

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|---|----------------------|----------------------------|
| 1. <i>D. acciaccatum</i> Mc Connaughey 1949 | <i>Octopus</i> sp. | California, USA |
| 2. <i>D. acheroni</i> Mc Connaughey 1949 | <i>Octopus</i> sp. | California, USA |
| 3. <i>D. acuticephalum</i> Nouvel 1947 | <i>O. vulgaris</i> | Japan |
| 4. <i>D. aegira</i> Mc Connaughey and Kritzler 1952 | <i>O. vulgaris</i> | Florida, USA |
| 5. <i>D. apalachiensis</i> Short 1962 | <i>O. joubini</i> | Apache Bay, Gulf of Mexico |
| 6. <i>D. apollyoni</i> Nouvel 1947 | <i>O. apollyon</i> | California, USA |
| 7. <i>D. australis</i> Penchaszadeh 1968 | <i>O. tehuelchus</i> | Australia |
| 8. <i>D. balamuthi</i> Mc Connaughey 1949 | <i>Octopus</i> sp. | San Francisco Bay, USA |

*Not referred to in original.

9. <i>D. benthoctopi</i> Hochberg and Short 1970	<i>Benthoctopus magellanicus</i>	Florida, USA
10. <i>D. bilobum</i> Couch and Short 1964	<i>O. vulgaris</i>	Northern Gulf of Mexico
11. <i>D. briarei</i> Short 1961	<i>O. briareus</i>	Florida, USA
12. <i>D. caudatum</i> Bogolepova-Dobrokhotova 1960	<i>O. vulgaris</i>	Russia
13. <i>D. clausianum</i> Van Beneden 1876	<i>O. macropus</i>	Eastern seas
14. <i>D. hypercephalum</i> Short 1962	<i>O. joubini</i>	Gulf of Mexico
15. <i>D. knoxi</i> Short 1964	<i>O. maorum</i>	Kaikura peninsula, New Zealand
16. <i>D. macrocephalum</i> Van Beneden 1878	<i>Sepietta oweniana</i> ; <i>S. obscura</i>	Mediterranean seas
17. <i>D. maorum</i> Short 1964	<i>O. maorum</i>	Kaikura peninsula, New Zealand.
18. <i>D. megalcephalum</i> Nouvel 1934	<i>Octopus</i> sp. (<i>vulgaris</i> or <i>rugosus</i>)	Mauritania, French, West Africa
19. <i>D. microcephalum</i> De Fillippi	<i>Octopus</i> sp.	Mediterranean seas
20. <i>D. misakiense</i> Nouvel and Makao 1938	<i>O. vulgaris</i>	Miasaki, Japan
21. <i>D. monodi</i> Novel 1934	<i>O. fangsiao</i>	
22. <i>D. moschatum</i> Whitman 1883	<i>O. vulgaris</i>	Mauritania, French, West Africa
	<i>Eledone moschata</i>	Naples, Italy
23. <i>D. orientalis</i> Nouvel and Nakao 1938	<i>Sepioteuthis lessoniana</i>	Japan
24. <i>D. paradoxum</i> Von Kolliker 1849	<i>O. macropus</i>	Mediterranean, Atlantic coast
	<i>O. vulgaris</i>	
25. <i>D. platycephalum</i> Penchaszadeh 1969	<i>O. tehuelchus</i>	Australia
26. <i>D. oligomerum</i> Bogolepova-Dobrokhotova 1960	<i>O. vulgaris</i>	Far eastern seas
27. <i>D. rondoletiolae</i> Nouvel 1944	<i>Rondeletiola minor</i> ; <i>Sepietta oweniana</i>	Mediterranean seas
28. <i>D. robsonellae</i> Short 1971	<i>Robsonella australis</i>	New Zealand
29. <i>D. rostrata</i> Short and Hochberg, 1971	<i>Octopus</i> sp.	Kaikura peninsula, New Zealand
30. <i>D. schulzianum</i> Van Beneden 1876	<i>Sepia biserialis</i> ; <i>S. elegans</i>	Mediterranean
31. <i>D. sullivanii</i> Mc Connaughey 1949	<i>O. bimaculatus</i>	Florida, USA
32. <i>D. truncatum</i> Whitman 1883	<i>Sepia elegans</i> <i>Sepia officinalis</i> ; <i>S. esculenta</i> Rossia <i>macronema</i>	Europe
33. <i>D. typus</i> Van Beneden 1876	<i>O. vulgaris</i>	Northern Gulf of Mexico
34. <i>D. typoides</i> Short 1964	<i>O. vulgaris</i>	Northern Gulf of Mexico